

**IN THE UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF MARYLAND**

G. W. ARU, LLC, et al.,

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Plaintiffs,

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v.

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Civ. No. JKB-22-2636

W. R. GRACE & CO.-CONN.,

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Defendant.

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MEMORANDUM AND ORDER

Plaintiffs G.W. Aru, LLC and Cochise Technology, LLC (collectively, “GWA”) allege infringement of U.S. Patent No. 11,224,864 (“the ‘864 Patent”) in violation of 35 U.S.C. § 271(a). (ECF No. 18.) The parties have asked this Court to construe certain claim language of the ‘864 Patent pursuant to *Markman v. Westview Instruments*, 517 U.S. 370 (1996). The issue has been fully briefed, and the Court held a *Markman* hearing on October 3, 2023. This Memorandum and Order sets forth the Court’s construction of the disputed terms in the ‘864 Patent.

I. BACKGROUND

GWA and Defendant W. R. Grace & Co.-Conn (“Grace”), formerly collaborators in a joint marketing agreement, are now competitors in the petrochemicals industry. GWA alleges that Grace “dangled a potential business relationship with the vastly smaller Aru over a period between 2018 and 2022.” (ECF No. 18 at 3.) During this period, GWA shared with Grace certain confidential business information, including information about GWA’s patented or patent-pending technology. Then, in early 2022, after having learned all “the details of Aru’s crown jewel technology and business case,” Grace allegedly cut ties with GWA and intentionally copied

GWA's patented "eggshell" design for carbon monoxide (CO) to carbon dioxide (CO₂) combustion promoters. (*Id.* at 3–5.) GWA filed the instant suit in October 2022. (ECF No. 1.)

A. The Claimed Invention

The patent-in-suit involves CO to CO₂ combustion promoters. These are small particles (less than a millimeter in length or diameter) which are used in fluid catalytic cracking (FCC), a process for refining crude oil into higher value products such as gasoline. (ECF No. 18 at 6–9.) As their name would suggest, CO to CO₂ combustion promoters help convert gaseous CO inside the FCC unit into CO₂, which is advantageous because excess CO in the FCC unit can lead to "afterburning," which can cause significant damage to the FCC equipment. (*Id.* at 8.) CO to CO₂ combustion promoters consist of a porous support particle, often made of alumina, impregnated with Group VIII noble metals (typically platinum or palladium).¹ These noble metals are the active component in promoting the conversion of CO to CO₂. (*Id.* at 8–9.)

The objective of the '864 Patent is "to provide a CO to CO₂ combustion promoter which requires less noble metal to achieve the same level of CO combustion in the FCC process." U.S. Patent No. 11,224,864 at 2:17–20. According to GWA, conventional CO to CO₂ combustion promoters have featured a uniform distribution of noble metals throughout the support particle. (ECF No. 18 at 13–14.) Figure 1 of the '864 Patent, produced below, shows a schematic of a cross section of a state-of-the-art combustion promoter particle featuring the traditional homogenous distribution of noble metals.

¹ The parties agree that "Group VIII noble metals" refers to "a metal chosen from the group of platinum, palladium, iridium, ruthenium, and/or rhodium." (ECF No. 72 at 2.)

combustion promoter” is “necessary to give life, meaning, and vitality to the claim.” *Cochlear Bone*, 958 F.3d at 1354.

Grace also relies on the undisputed fact that “CO to CO₂ combustion promoters were well known and widely used in the FCC industry long before the filing of the ‘864 patent.” (ECF No. 76 at 11.) However, the Federal Circuit has in multiple cases found preamble language limiting even when the terms in the preamble did not themselves disclose a novel invention. *See Piggy Pushers, LLC v. Skidders Footwear, Inc.* 544 F. App’x 984, 989 (Fed. Cir. 2013) (term “sock” in preamble was limiting); *Eli Lilly & Co.*, 8 F.4th at 1342 (term “method for treating headache” in preamble was limiting); *Rapoport v. Dement*, 254 F.3d 1053, 1059 (Fed. Cir. 2001) (term “method for treatment of sleep apneas” in preamble was limiting). The cases where the Federal Circuit has declined to find non-novel preamble language limiting are distinguishable from the present case. For example, in *Aspex Eyewear, Inc. v. Marchon Eyewear, Inc.*, the court held that the phrase “eyeglass device” in the preamble of a claim was not limiting. 672 F.3d 1335, 1347 (Fed. Cir. 2012). The court explained that the specification defined “eyeglass device” to include both a primary frame and an “auxiliary” frame (*e.g.*, for clip-on sunglasses), but some of the claims were directed only to a “primary” or an “auxiliary” frame rather than both. These distinctions supported an inference that “the claims drawn to primary or auxiliary frames alone are not intended, by operation of the preamble, to require the presence of the other frame as well.” *Id.* Here, by contrast, all claims in the ‘864 Patent are directed simply to a “combustion promoter,” with no distinctions drawn between different aspects or components of combustion promoters. Thus, unlike in *Aspex*, construing “combustion promoter” as limiting will not import a definition into the body of the claim that is in tension with other language in the claim.

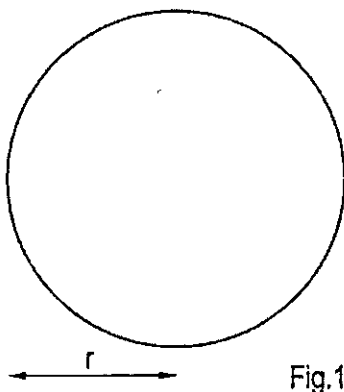


Fig.1

In the eggshell design featured in the patent-in-suit, by contrast, the noble metals are concentrated toward the surface of the combustion promoter particle, rather than being evenly distributed throughout the particle. (*Id.* at 14.) Figure 2 of the '864 Patent, produced below, shows a schematic of a cross section of the claimed combustion promoter particle. The region that appears to be an outer ring around the circle is described as the "outer eggshell" of the particle, which has a thickness (d) that may range between 1 to 10 microns. '864 Patent at 11:21–27. This outer eggshell contains "almost all" of the noble metals. *Id.*

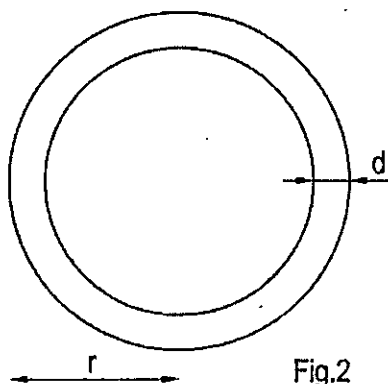


Fig.2

The specification teaches that the method for preparing the claimed combustion promoter particle involves mostly filling the pores of the base particle with a filler material such as water or oil, then introducing the particles to an aqueous solution containing the noble metals, then drying

or calcinating the particle. '864 Patent at 8:43–57. This process creates a particle where the noble metals are distributed mostly toward the surface of the pores, similarly to how an eggshell is located toward the surface of an egg.

According to GWA, the advantage of the claimed eggshell design is that it “greatly reduces the amount” of noble metals that must be added to the combustion promoters, which is advantageous because noble metals are “very expensive.” (ECF No. 18 at 14, 9.) In essence, GWA’s theory is that the conventional homogenous distribution of noble metals leads to wasted noble metal in the middle of the support particle, where it will never have the opportunity to perform its task of promoting the combustion of CO into CO₂. '864 Patent at 3:2–13. GWA also contends that the eggshell design inherently results in reduced emissions of nitrogen oxides (NO_x), which are environmentally harmful pollutants that are heavily regulated. (ECF No. 18 at 9, 11.)

B. The Parties’ Proposed Constructions

The First Amended Complaint alleges that Grace has infringed Claim 1 of the '864 Patent.

Claim 1 recites, in full:

What is claimed herein is:

1. A CO to CO₂ combustion promoter comprising microsphere sized porous particles, each microsphere sized porous particle having a diameter of less than 1 mm, and independently comprising:

silica, alumina, or mixtures thereof; and

one or more Group VIII noble metals distributed in the particle as an eggshell such that a higher concentration of the one or more Group VIII noble metals is present in the outer region of the microsphere sized porous particle as compared to the concentration of the one or more Group VIII noble metals in the centre [*sic*] of the microsphere sized porous particle.

'864 Patent at 14:45–57.

According to the Joint Claim Construction Statement (ECF No. 72), the parties agree on the construction of the following terms, produced below:

Undisputed Terms

Term	Agreed Construction
Preamble (“microsphere sized porous particles, each microsphere sized porous particle having a diameter of less than 1 mm, and independently comprising”)	Parties agree that this portion of preamble is limiting.
porous	Plain and ordinary meaning, which is “having passages accessible to liquid or air”
silica	Plain and ordinary meaning
alumina	Plain and ordinary meaning
Group VIII noble metal	“a metal chosen from the group of platinum, palladium, iridium, ruthenium, and/or rhodium”
concentration	“mass/volume”
average (D50) size	Plain and ordinary meaning
laser diffraction	Plain and ordinary meaning

The parties differ as to the construction of the following terms, produced below:

Disputed Terms

Term	GWA’s Construction/Position	Grace’s Construction/Position
CO to CO2 combustion promoter	This term is limiting and means “composition that promotes combustion of carbon monoxide to carbon dioxide”	This term is not limiting and/or is intended use. Alternatively, it means “composition that promotes the oxidation of carbon monoxide to carbon dioxide.”
each microsphere / independently	Plain and ordinary meaning; there is no requirement that “every” particle meet the claim limitations	Plain and ordinary meaning, i.e. “each and every microsphere must independently” Alternatively, indefinite
microsphere sized	“particles as small as 1 micron in diameter and as large as 1,000 microns”; this claim term specifies the sizes of particles, not a requirement of a spherical shape of particles	“spherical particles as small as 1 micron in diameter and as large as 1,000 microns”
eggshell	“the particle has an outer region with a relatively higher concentration of the one or more Group VIII noble metals than the center of the particle.” The patentee acted as its own lexicographer.	“a structure with an outer layer or ‘shell’ surrounding an inner layer that is chemically distinct from the outer layer”

outer region	Not indefinite. Parties' agreed construction is "a region distinguishable from the center of the particle and having a depth from the outer surface towards the interior of the particle of 1-10 microns"	Indefinite. Alternatively, Parties' agreed construction is "a region distinguishable from the center of the particle and having a depth from the outer surface towards the interior of the particle of 1-10 microns"
centre	Not indefinite. Parties' agreed construction is "a region distinguishable from the outer region of the particle"	Indefinite. Alternatively, Parties' agreed construction is "a region distinguishable from the outer region of the particle"

II. LEGAL STANDARD

A patent includes (1) the "specification," which describes the invention in terms that enable any person skilled in the art to make and use the invention, and (2) one or more "claims." *Markman*, 517 U.S. at 373. The "specification itself does not delimit the right to exclude. That is the function and purpose of claims." *Markman v. Westview Instruments, Inc.*, 52 F.3d 967, 980 (Fed. Cir. 1995). In other words, "the claims of a patent define the invention to which the patentee is entitled the right to exclude." *Innova/Pure Water, Inc. v. Safari Water Filtration Sys., Inc.*, 381 F.3d 1111, 1114 (Fed. Cir. 2004). Claim construction is the process of "determining the meaning and scope of the patent claims asserted to be infringed," *Markman*, 52 F.3d at 976, and is a matter for the Court to decide, *Teva Pharms. USA, Inc. v. Sandoz, Inc.*, 574 U.S. 318, 326 (2015).

The words of a patent claim are generally given their ordinary and customary meaning, which "is the meaning that the term would have to a person of ordinary skill in the art [POSITA] in question at the time of the invention." *Phillips v. AWH Corp.*, 415 F.3d 1303, 1312–13 (Fed. Cir. 2005). In construing the ordinary and customary meaning of a claim term, the Court must begin with the patent's "intrinsic evidence," which includes the entirety of the patent itself and the patent's prosecution history (which "consists of the complete record of the proceedings before the PTO [Patent and Trademark Office] and includes the prior art cited during the examination of the patent"). *Id.* at 1313, 1317. The Court should read the claim term in the context of surrounding

words in the claim and may also consider “other claims of the patent in question, both asserted and unasserted.” *Id.* at 1314. The Court must also look to the specification, which “is always highly relevant to the claim construction analysis. Usually, it is dispositive; it is the single best guide to the meaning of a disputed term.” *Vitronics Corp. v. Conceptronic, Inc.*, 90 F.3d 1576, 1582 (Fed. Cir. 1996). Furthermore, the Court “should also consider the patent’s prosecution history, if it is in evidence.” *Markman*, 52 F.3d at 980. The prosecution history “often lacks the clarity of the specification and thus is less useful for claim construction purposes,” but may have value in reflecting how the inventor understood the invention and in determining whether the inventor disclaimed any otherwise-permissible interpretations of claim terms. *Phillips*, 415 F.3d at 1317.

In addition to considering intrinsic evidence, the Court may in appropriate circumstances consider extrinsic evidence such as expert testimony, dictionaries, and learned treatises. *Phillips*, 415 F.3d at 1317, 1319. Such evidence may help the Court resolve ambiguities and enhance the Court’s understanding of how a POSITA would read the terms at issue. *Id.* at 1318. However, the Federal Circuit has cautioned that extrinsic evidence is “in general . . . less reliable than the patent and its prosecution history in determining how to read claim terms.” *Id.* For this reason, “[i]f the meaning of a claim term is clear from the intrinsic evidence, there is no reason to resort to extrinsic evidence.” *Seabed Geosolutions (US) Inc. v. Magseis FF LLC*, 8 F.4th 1285, 1287 (Fed. Cir. 2021). Even if the Court does consider extrinsic evidence, it “may not be used ‘to contradict claim meaning that is unambiguous in light of the intrinsic evidence.’” *Profectus Tech. LLC v. Huawei Techs. Co.*, 823 F.3d 1375, 1380 (Fed. Cir. 2016) (quoting *Phillips*, 415 F.3d at 1324).

III. WAIVER OF INDEFINITENESS

A. Background

Before turning to the merits of the parties' respective proposed constructions, the Court must first address GWA's argument that Grace has waived any objections to the '864 Patent on the grounds of indefiniteness.

"Like many other federal district courts, this court has adopted local rules to govern patent litigation." *Changzhou Kaidi Elec. Co. v. Okin Am., Inc.*, 112 F. Supp. 3d 330, 332 (D. Md. 2015). These rules are designed to "require the parties to crystallize their theories of the case early in the litigation," *id.*, and "ensure that theories of infringement and invalidity are provided early enough to permit adequate preparation for trial," *M-Edge Int'l Corp. v. Lifeworks Tech. Grp. LLC*, Civ. No. MIG-14-3627, 2017 WL 930128, at *3 (D. Md. Mar. 9, 2017).

As relevant here, Local Rule 804 provides that, thirty days after the entry of the Scheduling Order, a party alleging patent infringement must serve on all parties an initial disclosure of "Infringement Contentions." Local Rule 804.1(a) (D. Md. 2023). Sixty days after the entry of the Scheduling Order, a party opposing a claim of infringement must serve on all parties its "Invalidity Contentions." *Id.* 804.1(c). These Invalidity Contentions must identify, inter alia, "any grounds of invalidity based on . . . indefiniteness under 35 U.S.C. 112 ¶(2)[.]" *Id.* 804.1(c)(iv).

The January 26 Scheduling Order modified the Local Rule 804 timeline by giving the parties more time to serve their respective contentions. (ECF No. 24.) GWA was directed to serve its Infringement Contentions by April 14, 2023, and Grace was directed to serve its Invalidity Contentions by May 15, 2023. (*Id.*)

Grace timely served its Invalidity Contentions on GWA on May 15, 2023. (ECF No. 76-10.) The section of Grace's Contentions regarding indefiniteness is as follows:

V. INVALIDITY UNDER AIA 35 U.S.C. § 112(a) and/or (b)

Subject to Grace's Reservation of Rights set forth herein, Grace identifies the following grounds for invalidity of the Asserted Claims based on indefiniteness, written description, and/or enablement:

- "each microsphere sized porous particle having a diameter of less than 1mm, and independently"
- "one or more Group VIII noble metals distributed in the particle as an eggshell such that a higher concentration of the one or more Group VIII noble metals is present in the outer region of the microsphere sized porous particle as compared to the concentration of the one or more Group VIII noble metals in the centre of the microsphere sized porous particle"

(Exhibit J at 19, ECF No. 76-10 at 22.)

GWA argues that this disclosure was inadequate under Local Rule 804 because "Grace did not specify which Section 112 defense(s) applied to which claim terms and did not articulate grounds of any theory of invalidity under Section 112." (ECF No. 77 at 13.) Therefore, GWA asks the Court to find that Grace waived any indefiniteness contentions. (*Id.*)

B. Analysis

Because Grace's Invalidity Contentions were adequate under Local Rule 804, the Court declines to find waiver of indefiniteness.

The relevant provision of the Local Rule provides simply that a party asserting indefiniteness must provide the "grounds" for that contention, not a party's "theories" or "arguments" regarding that contention. Local Rule 804.1(c)(iv). Here, Grace cited the applicable statutory provision for invalidity based on indefiniteness and identified the specific claim language that it contended was indefinite. To be sure, Grace's indefiniteness contention was no model of thoroughness. But it provided GWA with notice of Grace's intention to assert that certain language in Claim 1 of the '864 Patent was invalid on the basis of indefiniteness under 35 U.S.C. 112(b), and that is all Local Rule 804(c) requires.

Changzhou, on which GWA relies, is not to the contrary. In that case, the plaintiff (who was seeking a declaratory judgment of non-infringement) sought to raise contentions based on novel theories of anticipation and obviousness after the close of discovery and several months before trial. 112 F. Supp. 3d at 333. These contentions were never raised in its original invalidity contentions, which contained only a highly generic statement that other, unspecified combinations in prior art anticipated the patent-in-suit or made it non-obvious. *Changzhou*, 112 F. Supp. 3d at 332–33, 337. The court granted the defendant’s motion to exclude evidence pertaining to these novel invalidity contentions as a sanction for violating Local Rule 804.1(c). *Id.* at 339.

Changzhou is distinguishable from the present case for two reasons. For one, the plaintiff in *Changzhou* sought to raise its new invalidity contentions “nearly 15 months after its initial invalidity disclosures, after the close of fact discovery, and four months before the trial.” *Id.* at 337. Here, by contrast, fact discovery will not close until January 2024 (ECF No. 24 at 2), and a trial has yet to be scheduled. Thus, there is no last-minute hail-Mary-style disruption at issue in this case. Second, and even more importantly, *Changzhou* dealt with new invalidity contentions based on anticipation and obviousness, not (as is the case here) indefiniteness. This distinction is important because, as the court in *Changzhou* explained, “[w]here, as here, a party’s invalidity contentions refer to several prior patents, the many elements contained in each item of prior art may be mixed in literally thousands of alternative combinations.” *Id.* at 334. Because anticipation and obviousness assertions inherently require references to prior patents, a generic statement in a party’s Invalidity Contentions that other, unspecified, combinations contain teachings “applicable to each element of the asserted claims” is not sufficient to give the opposing party a fair opportunity to respond. *Id.* at 332. Such a generic assertion leaves the opposing party lost at sea, with no idea which one of uncountable numbers of prior patent claims are alleged to have anticipated the patent-

in-suit or rendered it obvious. By contrast, a defense based on indefiniteness does not require the party alleging infringement to search out other patents; instead, indefiniteness can generally be resolved on the basis of the patent's intrinsic evidence, which the party alleging infringement presumptively has full access to.

This distinction is borne out in the vastly different amount of detail the Local Rules require for contentions based on anticipation and obviousness versus invalidity contentions based on indefiniteness. A party asserting obviousness or anticipation must, in its disclosure, identify, *inter alia*, "each item of prior art that allegedly anticipates each asserted claim or renders it obvious," explain how the prior art anticipates the claimed invention or makes it obvious, and provide a chart detailing how each item of prior art anticipates or makes obvious each limitation of each asserted claim. Local Rule 804.1(c)(i)–(iii). By contrast, as stated above, to assert a claim of indefiniteness, a party must simply identify "[a]ny grounds of invalidity based on . . . indefiniteness." *Id.* 804.1(c)(iv). Thus, the Local Rules contemplate that contentions based on obviousness and anticipation will be much more detailed than contentions based on indefiniteness.

Finally, although GWA declined to address the substance of Grace's indefiniteness contentions in their opening brief, GWA *did* address the issue of indefiniteness at length in its Responsive Claim Construction Brief, (see ECF No. 96 at 1 – 9), and at oral argument during the *Markman* hearing. Thus, GWA has had an opportunity to respond to Grace's indefiniteness contentions.

For these reasons, the Court holds that Grace has not waived its indefiniteness contentions with respect to Claim 1 of the '864 Patent. That said, for reasons discussed below, the Court will defer consideration of indefiniteness until summary judgment.

The Court will now turn to the merits of claim construction.

IV. DISCUSSION

A. Person of Ordinary Skill in the Art

The parties agree that for the purposes of the '864 Patent, a POSITA “would have had an advanced degree in a relevant field, such as chemistry, chemical engineering, or material science, with experience working with supported metal catalysts, and had at least 2-3 years of experience with oxidation catalysts and their application. Work experience can compensate for less formal education, and vice versa.” (ECF Nos. 76 at 9, 77 at 11–12). The Court adopts this definition.

B. Whether “CO to CO₂ combustion promoter” is limiting

The parties do not dispute—and the Court agrees—that the portion of the preamble reciting “microsphere sized porous particles, each microsphere sized porous particle having a diameter of less than 1 mm, and independently comprising” is limiting. (ECF No. 72 at 1.) The parties’ disagreement is whether the preamble phrase “CO to CO₂ combustion promoter” is also limiting, with GWA arguing that it is limiting, and Grace arguing that it is not. The Court agrees with GWA that this phrase is limiting.

1. Legal Standard

A preamble of a claim is often, as is the case here, set off from the body of a claim by the term “comprising.” *SIMO Holdings Inc. v. Hong Kong uCloudlink Network Tech. Ltd.*, 983 F.3d 1367, 1375 (Fed. Cir. 2021). Whether a preamble limits the scope of a claimed invention, or merely states an intended use or preferred embodiment, is a claim construction issue. *Arctic Cat Inc. v. GEP Power Prods., Inc.*, 919 F.3d 1320, 1327 (Fed. Cir. 2019).

The Federal Circuit has stated that “as a general rule preamble language is not treated as limiting.” *Aspex Eyewear, Inc. v. Marchon Eyewear, Inc.*, 672 F.3d 1335, 1347 (Fed. Cir. 2012). However, this is not a hard-and-fast rule; “whether to treat a preamble as a limitation is determined

on the facts of each case in light of the overall form of the claim and the invention as described in the specification and illuminated in the prosecution history.” *Cochlear Bone Anchored Solutions AB v. Oticon Medical AB*, 958 F.3d 1348, 1355 (Fed. Cir. 2020) (quotation and alterations omitted). For this reason, “it is not unusual for th[e] court to treat preamble language as limiting.” *Bicon, Inc. v. Straumann Co.*, 441 F.3d 945, 952 (Fed. Cir. 2006).

“[T]here is no ‘litmus test’ for determining whether preamble language is limiting.” *Id.* (quoting *Catalina Mktg. Int’l, Inc. v. Coolsavings.com, Inc.*, 289 F.3d 801, 808 (Fed. Cir. 2002)). But the Federal Circuit has identified several principles to help guide this Court’s inquiry. A preamble will be treated as limiting “if it recites essential structure or steps, or if it is necessary to give life, meaning, and vitality to the claim.” *Cochlear Bone*, 958 F.3d at 1354 (quoting *Catalina*, 289 F.3d at 808). The preamble may also be limiting when it is “essential to understand limitations or terms in the claim body,” terms in the body of the claim “depend[] on a particular disputed preamble phrase for antecedent basis,” or there was “clear reliance on the preamble during prosecution to distinguish the claimed invention from the prior art.” *Georgetown R. Equip. Co. v. Holland L.P.*, 867 F.3d 1229, 1236 (Fed. Cir. 2017) (quoting *Catalina*, 289 F.3d at 808). By contrast, a preamble will not be treated as limiting “if the claim body ‘defines a structurally complete invention . . . and uses the preamble only to state a purpose or intended use for the invention.’” *Id.* (quoting *Rowe v. Dror*, 112 F.3d 473, 478 (Fed. Cir. 1997)) (alteration in original). Nor is the preamble limiting when it “merely extoll[s] benefits or features of the claimed invention.” *Id.* (quoting *Catalina*, 289 F.3d at 809).

The fact that a portion of a preamble is limiting does not necessarily mean that the entire preamble must be limiting. *TomTom, Inc. v. Adolph*, 790 F.3d 1315, 1323 (Fed. Cir. 2015). However, the Federal Circuit has stated that it is “disinclined to sanction finding a preamble

‘partially’ limiting.” *Bio-Rad Labs., Inc. v. 10X Genomics, Inc.*, 967 F.3d 1353, 1371 (Fed. Cir. 2020); *see also Simo Holdings*, 983 F.3d at 1376 (Fed. Cir. 2021).

2. Analysis

The Court begins with the language of Claim 1 itself. The claim is directed toward “[a] CO to CO₂ combustion promoter comprising microsphere sized porous particles[.]” ‘864 Patent at 14:46–47. This language does not itself suggest that a CO to CO₂ combustion promoter is merely an intended use of the claimed invention. Importantly, the preamble does not use the “standard pattern” for expressing intended use of a claim, which is “for [a purpose or intended use] comprising . . .”. *TomTom*, 790 F.3d at 1323 (alterations added). Here, there is no “for” language. Thus, the language of the claim suggests, although does not on its own prove, that the phrase “CO to CO₂ combustion promoter” is intended to be limiting.

The language of the claim itself is not conclusive, but an examination of the specification and title of the ‘864 Patent leads the Court to conclude that the phrase “combustion promoter” is limiting. The ‘864 Patent states in the abstract that it is “directed to a CO to CO₂ combustion promoter.” ‘864 Patent, abstract & 1:20–21. The specification refers repeatedly to “the combustion promoter according to the [or ‘this’] invention,” *id.* at 3:40 – 50, 5:12 –13, 8:39–40, 13:54–55, which tends to support the conclusion that the phrase is limiting. *See Regents of Univ. of Minn. v. AGA Med. Corp.*, 717 F.3d 929, 936 (Fed. Cir. 2013) (“When a patent thus describes the features of the ‘present invention’ as a whole, this description limits the scope of the invention.”) (quotation omitted). The specification discusses combustion promoters continuously and addresses in extensive detail the problems with the state-of-the-art combustion promoters that the invention is intended to address. *See* ‘864 Patent at 1–8. Furthermore, the patent is entitled

“CO to CO₂ Combustion Promoter.”² The pervasive focus on combustion promoters throughout every portion of the patent, including the specification and title, strongly suggests that the phrase “combustion promoter” in Claim 1 is limiting. *See Eli Lilly & Co. v. Teva Pharms. Int’l GmbH*, 8 F.4th 1331, 1342 (Fed. Cir. 2021) (concluding that a preamble describing a “method for treating headache” was limiting when the patent contained “extensive discussions of such treatment in every section of the patent’s written description”); *Deere & Co. v. Bush Hog, LLC*, 703 F.3d 1349, 1358 (Fed. Cir. 2012) (concluding that the phrase “rotary cutter deck” in a preamble was limiting when “[t]he title of the patent, the summary of the invention, and every drawing describe the invention as a deck for a rotary cutter”); *Honeywell Int’l, Inc. v. ITT Indus., Inc.*, 452 F.3d 1312, 1318 (Fed. Cir. 2006) (concluding that the specification’s “detailed discussion of the prior art problem addressed by the patented invention . . . further supports the conclusion” that a term was limiting); *Poly-Am., L.P. v. GSE Lining Tech., Inc.*, 383 F.3d 1303, 1310 (Fed. Cir. 2004) (concluding that the phrase “blown-film” in a preamble was limiting when “the specification is replete with references to the invention as a ‘blown film’ liner, including the title of the patent itself”).

The Court’s conclusion is reinforced by the fact that Claims 2–10, as well as Claims 12, 16, and 18, refer to “[t]he combustion promoter according to claim 1.” *See Phillips*, 415 F.3d at 1314 (explaining that when construing a claim the court should look to other claims in the patent, whether or not those other claims were also alleged to be infringed). The fact that other claims in

² Grace argues that “whether the term is the title of the patent has no bearing on whether it is essential to the invention; on the contrary, the title of the patent can also be its intended use.” (ECF No. 95 at 13.) The Court agrees that the title of a patent is not, on its own, dispositive of whether a claim term is limiting. But it is surely highly relevant evidence to consider. The one case that Grace cites in trying to diminish the importance of the title, *JVW Enters. v. Interact Accessories, Inc.*, is not on point because that case did not involve any consideration of whether the terms in the title of the patent at issue were limiting. Civ. No. A. MJG 00-1867, 2002 WL 32996225 (D. Md. Feb. 1, 2002).

the '864 Patent refer to Claim 1 as describing a “combustion promoter” strongly suggests that the Claim 1 is not merely directed toward an invention that could be used as a combustion promoter, but is instead directed at a combustion promoter *as the invention itself*. See *Pacing Techs., LLC v. Garmin Intern., Inc.*, 778 F.3d 1021, 1024 (Fed. Cir. 2015) (concluding that the term “repetitive motion pacing system for pacing a user” in the preamble to claim 25 of a challenged patent was limiting in part because another claim in the patent referred to “[t]he repetitive motion pacing system of claim 25” (alteration in original)).

The patent prosecution history also supports the conclusion that the phrase is limiting. To overcome the examiner’s obviousness rejection, the patentee argued that the claimed invention produced non-obvious advantages over the state of the art because “[t]he instant combustion promoters provide the same level of combustion promoter activity as the prior art non-eggshell promoters, while using significantly less noble metal per particle” and because the promoter “provides combustion with less NO_x formation.” (ECF No. 77-4 at 21.) These advantages make sense only if the claimed invention is understood to necessarily be a combustion promoter.

Grace relies heavily on the argument that the language after “CO to CO₂ combustion promoter” in the preamble arguably “sets out the complete invention,” *Eaton Corp. v. Rockwell Intern. Corp.* 323 F.3d 1332, 1339 (Fed. Cir. 2003) (quotation omitted), in the sense that the claim body is “structurally complete without reference to the phrase ‘CO to CO₂ combustion promoter’.” (ECF No. 76 at 10–11; *see also* ECF No. 95 at 14.) But, as has already been stated, there is no litmus test for whether a preamble term is limiting. *Bicon*, 441 F.3d at 952. And in the context of this patent, it is clear that a “CO to CO₂ combustion promoter” is what the microsphere sized porous particles disclosed in the rest of the claim *are*; that is to say, the phrase “CO to CO₂

combustion promoter” is “necessary to give life, meaning, and vitality to the claim.” *Cochlear Bone*, 958 F.3d at 1354.

Grace also relies on the undisputed fact that “CO to CO₂ combustion promoters were well known and widely used in the FCC industry long before the filing of the ‘864 patent.” (ECF No. 76 at 11.) However, the Federal Circuit has in multiple cases found preamble language limiting even when the terms in the preamble did not themselves disclose a novel invention. *See Piggy Pushers, LLC v. Skidders Footwear, Inc.* 544 F. App’x 984, 989 (Fed. Cir. 2013) (term “sock” in preamble was limiting); *Eli Lilly & Co.*, 8 F.4th at 1342 (term “method for treating headache” in preamble was limiting); *Rapoport v. Dement*, 254 F.3d 1053, 1059 (Fed. Cir. 2001) (term “method for treatment of sleep apneas” in preamble was limiting). The cases where the Federal Circuit has declined to find non-novel preamble language limiting are distinguishable from the present case. For example, in *Aspex Eyewear, Inc. v. Marchon Eyewear, Inc.*, the court held that the phrase “eyeglass device” in the preamble of a claim was not limiting. 672 F.3d 1335, 1347 (Fed. Cir. 2012). The court explained that the specification defined “eyeglass device” to include both a primary frame and an “auxiliary” frame (*e.g.*, for clip-on sunglasses), but some of the claims were directed only to a “primary” or an “auxiliary” frame rather than both. These distinctions supported an inference that “the claims drawn to primary or auxiliary frames alone are not intended, by operation of the preamble, to require the presence of the other frame as well.” *Id.* Here, by contrast, all claims in the ‘864 Patent are directed simply to a “combustion promoter,” with no distinctions drawn between different aspects or components of combustion promoters. Thus, unlike in *Aspex*, construing “combustion promoter” as limiting will not import a definition into the body of the claim that is in tension with other language in the claim.

Arctic Cat Inc. v. GEP Power Prods., Inc., 919 F.3d 1320 (Fed. Cir. 2019) is also distinguishable. In that case, the preamble of one of the disputed claims recited “[a] power distribution module for a personal recreational vehicle,” and then the body of the claim detailed the specific limitations of the module. *Id.* at 1328. The court held that the language was not limiting because the body of the claim focused only on the module and the claim language indicated that “for a personal recreational vehicle” indicated the preferred use of the invention. *Id.* 1328–29. Notably, that “for” language, which is the “standard pattern” for expressing intended use of a claim, *TomTom*, 790 F.3d at 1323, is absent from the preamble of Claim 1 of the ‘864 Patent. The court also held that “recreational vehicle” in another disputed claim was not limiting because the vehicle itself “is entirely conventional” and the specification did not discuss the recreational vehicle in any detail. *Id.* at 1329–30. The ‘864 Patent, by contrast, discusses CO to CO₂ combustion promoters at considerable length and detail.

Simply put, there is not a single sentence anywhere in the patent specification or claims that suggests that a combustion promoter is merely the intended use of the invention; indeed, every indication suggests the opposite, namely that a combustion promoter “is not a preferred embodiment, but an *only* embodiment.” *Honeywell*, 452 F.3d at 1318 (emphasis added). In other words, the phrase “CO to CO₂ combustion promoter” “does not state a purpose or an intended use of the invention, but rather discloses a fundamental characteristic of the claimed invention that is properly construed as a limitation of the claim itself.” *Poly-Am.*, 383 F.3d at 1310 (quotation omitted). Nothing in the patent’s intrinsic evidence, nor in the extrinsic evidence to which the parties have directed the Court, suggests that the microsphere sized porous particles of the kind disclosed in Claim 1 have any function, utility, or even existence *whatsoever* except insofar as the particles act as CO to CO₂ combustion promoters. In short, a CO to CO₂ combustion promoter is

“the essence of the invention[,] without which” the disclosure of the microsphere sized porous particles would be “nothing but an academic exercise.” *Boehringer Ingelheim Vetmedica, Inc. v. Schering-Plough Corp.*, 320 F.3d 1339, 1345 (Fed. Cir. 2003).

Because the Court concludes that the phrase “CO to CO₂ combustion promoter” is limiting, the Court will turn to construing the disputed term “combustion.”

C. “Combustion”

GWA argues that the word “combustion” in the phrase “CO to CO₂ combustion promoter” need not be construed at all because its ordinary meaning would be apparent to laypeople. (ECF No. 77 at 17–18; ECF No. 96 at 16.) Grace, meanwhile, argues that “combustion” should be construed to mean “oxidation.” (ECF No. 76 at 12–14; ECF No. 95 15–16.) In response, GWA contends that—if the term *does* need to be construed—“combustion involves oxidation, but it is oxidation occurring at a rate fast enough to produce heat and, usually, light.” (ECF No. 77 at 18.)

The Federal Circuit has explained that, in some instances, the meaning that a POSITA would ascribe to a claim term “may be readily apparent even to lay judges, and claim construction in such cases involves little more than the application of the widely accepted meaning of commonly understood terms.” *Phillips*, 415 F.3d at 1314. However, the Federal Circuit has also made clear that when the claim term is disputed, “it is the court’s duty to resolve it.” *O2 Micro Intern. Ltd. v. Beyond Innovation Tech. Co., Ltd.*, 521 F.3d 1351, 1362 (Fed. Cir. 2008). In such a circumstance, simply declaring that the claim “needs no construction” or has the “plain and ordinary meaning” is not enough. *Id.* at 1361. In the interests of settling the parties’ dispute about the meaning of “combustion,” the Court will provide a specific construction for the word.

Nowhere in the patent are the terms “oxidation” or “combustion” defined. Grace correctly observes that the patent appears to use the words interchangeably without drawing a clear

distinction between them. *See, e.g.*, ‘864 Patent at 11:56–58 (“The oxidation response is a measure of the amount of CO which is combusted (oxidized) to CO₂.”); *id.* at 3:6–8 (“This is because the CO to CO₂ oxidation as catalyzed by a Group VIII noble metal is a very rapid, essentially instantaneous, reaction . . .”); *id.* at 3:10–13 (“Thus, the noble metal in the center of the particle is not active for CO to CO₂ oxidation as the reactant gases (CO and O₂) react before reaching this noble metal.”); *id.* at 3:23–25 (“Further, it is known the noble metal will sinter in time making the combustion promoter less active for CO to CO₂ oxidation.”).

On the basis of this observation, Grace contends that in the ‘864 Patent, combustion means oxidation; *i.e.*, the words are synonymous. But this conclusion reaches beyond what logic and the caselaw compels.³ *See Thorner v. Sony Comp. Entertainment Am. LLC*, 669 F.3d 1362, 1368 (Fed. Cir. 2012) (explaining that using two terms as alternatives in a patent does not necessarily mean they are synonymous). The fact that the patent uses the words “oxidation” and “combustion” interchangeably is not necessarily inconsistent with GWA’s theory that “combustion” is simply a special type of oxidation. In much the same way, imagine one were to write an essay about one’s beloved canine companion. The essay might refer to the animal by turns as a “dog” or a “poodle.” The use of these words interchangeably would not mean that “poodle” and “dog” are perfectly synonymous terms; rather, any reader competent in the English language would understand that “poodle” is a special type, or subset, of the broader category of “dog.”

In short, a review of the intrinsic evidence of the patent shows that the patentee understood combustion to be closely linked to oxidation but does little to shed light on the whether combustion

³ In further support of this argument, Grace cites to a statement by Plaintiffs’ witness Dr. Natalie Herring, in which she refers to the reaction of CO to CO₂ as “CO oxidation, converting carbon monoxide to carbon dioxide.” (ECF No. 76 at 13 (quoting Herring Dep., 12:15–16, ECF No. 76-3.)). Grace explains that this statement means that “Dr. Herring admitted that ‘combustion’ means or is at least synonymous with ‘oxidation.’” (*Id.* at 14.) This conclusion suffers from the same logical flaw as does Grace’s argument based on the text of the ‘864 Patent.

is synonymous with oxidation or rather is a subset of oxidation. So, the Court will turn to extrinsic evidence. And the extrinsic evidence overwhelmingly confirms that “combustion” has a more specific meaning than oxidation.

GWA cites to a variety of dictionary definitions of the word “combustion” in their brief. (ECF No. 77 at 17–18.) The Federal Circuit has warned of the perils of relying too much on dictionaries to construe disputed patent claim terms. *See Phillips*, 415 F.3d at 1319–23. Among the dangers inherent in dictionary definitions is the risk of “focus[ing] the inquiry on the abstract meaning of words rather than on the meaning of claim terms within the context of the patent,” the risk that general dictionaries will contain overly broad definitions, that even technical dictionaries might contain definitions different from what the patentee intended, and that a claim could improperly “rise or fall based upon the preferences of a particular dictionary editor.” *Id.* Nevertheless, in the same opinion, the court emphasized that it did “not intend to preclude the appropriate use of dictionaries.” *Id.* at 1322. Because dictionaries, especially technical ones “endeavor to collect the accepted meanings of terms used in various fields of science and technology,” they remain a useful tool in claim construction. *Id.* at 1318.

Mindful of the Federal Circuit’s cautions, the Court turns to the dictionary definitions in evidence in this case. The ASTM Dictionary of Engineering Science and Technology provides five definitions of “combustion.” The first entry defines the word as “a chemical process of oxidation that occurs at a rate fast enough to produce heat and usually light either as glow or flames.” *ASTM Dictionary of Engineering Science & Technology* 121 (5th ed. 2005) (ECF No. 77-7 at 5). The other four definitions, while varying slightly, also all refer to “combustion” as a process of “oxidation” that also involves heat and light (three out of the other four say “usually light”; one simply says “light”). *Id.* The ASTM definitions are particularly important because the

'864 Patent refers to ASTM standards three times in describing properties of combustion promoters, '864 Patent at 6:27, 12:61, 15:19, and because two of Grace's own witnesses have identified ASTM standards as well-known in the FCC industry. (ECF No. 69 at 8 (citing True Dep. at 12:2-5, 12:22-13:3, 13:8-11, 101:19-102:4 (ECF No. 69-1 at 5-6, 28); Ziebarth Dep. at 56:2-9, 64:17-65:1, 66:15-67:8 (ECF No. 69-2 at 16, 18-19)).) It is therefore reasonable to believe that the ASTM definition of "combustion" comports with a POSITA's understanding of the term.

Other dictionary definitions cited by GWA also generally refer to combustion as a process of oxidation involving heat and usually light or incorporate some concept of burning or exothermicity. See *Britannica Online Encyclopedia* (ECF No. 77-8 at 2) ("a chemical reaction between substances, usually including oxygen and usually accompanied by generation of heat and light in the form of flame"); *McGraw-Hill Dictionary of Scientific and Technical Terms* 437 (6th ed. 2002) (ECF No. 77-9 at 4) ("[t]he burning of gas, liquid, or solid, in which the fuel is oxidized, evolving heat and often light"); *McGraw-Hill Concise Encyclopedia of Science and Technology* 524 (6th ed. 2009) (ECF No. 77-10 at 4) ("the burning of any substance, in gaseous, liquid, or solid form"); *Oxford Dictionary of Mechanical Engineering* 92 (2d ed. 2019) (ECF No. 77-11 at 3) ("[a]n exothermic chemical reaction in which a fuel and an oxidant, typically air, react together to release a significant quantity of thermal energy in the presence of a flame"); *Hawley's Condensed Chemical Dictionary* 360 (16th ed. 2016) (ECF No. 77-12 at 4) ("[a]n exothermic oxidation reaction that may occur with any organic compound, as well as with certain elements, e.g., hydrogen, sulfur, phosphorus, magnesium"). Grace does not offer any countervailing dictionary definitions of "combustion" or dispute that these definitions broadly capture how a POSITA would understand the term. See *Mangosoft, Inc. v. Oracle Corp.*, 525 F.3d 1327, 1334 (Fed. Cir. 2008) (construing a claim term based on the technical dictionary definition when the opposing party

“neither provides a persuasive reason to disregard it, nor contests that it accurately reflects the general meaning of this term to those of skill in the art”).

A review of the extrinsic evidence shows combustion is not synonymous with oxidation but is instead a special type of oxidation, namely, one that involves heat and usually light. Accordingly, the Court will construe the word “combustion” to mean “a process of oxidation that releases heat and usually light.”

D. “Each”

The parties agree that the word “each” should be given its “plain and ordinary meaning,” but they differ on what that meaning is. Construing so basic a word is no easy task because it cannot easily be broken down into simpler components that do not themselves partake of the concept of “each.” Nevertheless, the Court will endeavor to do so.

GWA contends that “each” should be given its ordinary meaning and that the claim contains “no requirement that ‘every’ particle meet the claim limitations.” (ECF No. 77 at 19.) Grace argues that “each” should be construed to mean “each and every microsphere must independently” conform to the limitations, and that any other construction would render the term indefinite. (ECF No. 76 at 14.)

In their briefs and at the *Markman* hearing, the parties staked out maximalist positions on the meaning of “each,” neither of which the Court is inclined to adopt. Grace argues that because the claim, properly construed, is directed only toward a promoter in which “each and every” particle meets the limitations, a combustion promoter would not be within the scope of the patent unless every single one of the millions or more of particles in a given sample conforms to the limitations. (ECF No. 76 at 14–17.) At the *Markman* hearing, counsel for Grace stated that under their construction, GWA could not prove infringement unless it could show that every single

particle in a sample of billions conformed to the claim limitations. GWA argues—and the Court is inclined to agree—that “[i]t defies logic and the law to read this phrase as imposing a requirement that *every single one* of the potentially billions or trillions of particles in an arbitrary sample of a CO to CO₂ combustion promoter meets the claim limitations.” (ECF No. 96 (emphasis in original).)

But GWA’s position is similarly untenable. GWA argues that a “CO to CO₂ combustion promoter is infringing if some, but not all, of the particles meet the claim limitations.” (ECF No. 96 at 11.) At the *Markman* hearing, the Court asked counsel for GWA to clarify what “each” means if it does not mean “each and every.” Counsel explained that “each” means that the infringement analysis must be conducted at the level of the “individual particles” of the combustion promoter. In essence, GWA argues that if even one (or a tiny number) of particles in a sample of millions or billions conforms to the patent specifications, then the ‘864 Patent has been infringed. The problem with GWA’s approach is twofold. For one, Claim 1 is directed toward a “combustion promoter comprising microsphere sized porous particles,” not a single “combustion promoter comprising a microsphere sized particle.” ‘864 Patent at 14:46–47. The use of the plural suggests that the claimed invention is a sample of particles, not an individual particle. Second, GWA’s construction suffers from an equal but opposite level of absurdity as does Grace’s; in a sample of millions of microscopic particles that will inherently have some degree of random variability, it strains reason to hold that a competitor would infringe if a couple particles happen by random variation and the sheer laws of probability to conform to the claimed limitations.

In essence, the parties’ dispute relates less to the meaning of the word “each,” and more to the implications of that meaning for the purposes of analyzing infringement. At the claim construction stage, the Court must not prejudge questions of infringement or read the claim in such

a way as to “obviate factual questions of infringement,” *Am. Piledriving Equip. Inc. v. Geoquip, Inc.*, 637 F.3d 1324, 1331 (Fed. Cir. 2011), but at the same time it is appropriate for the Court to consider how claim construction will bear on the ultimate question of infringement, *Wilson Sporting Goods Co. v. Hillerich & Bradby Co.*, 442 F.3d 1322, 1326 (Fed. Cir. 2006). Without in any way deciding whether Grace’s products are infringing, the Court observes that the fact that the claim is directed to a combustion promoter wherein “each” particle meets the limitations does not necessarily mean that a competitor could avoid infringement by mixing in a trivial number of non-conforming particles in its competing promoter product. *See Pozen Inc. v. Par Pharm., Inc.*, 696 F.3d 1151, 1170–71 (Fed. Cir. 2012) (holding that a claim directed toward a pill with a layer with 90% of an active ingredient could be infringed by a pill with 85% of that ingredient, because “[u]nder the doctrine of equivalents a tablet layer with 85% of the agent can be fairly characterized as an insubstantial change from a tablet layer with 90% of the agent.”); *see also Adams Respiratory Therapeutics, Inc. v. Perrigo Co.*, 616 F.3d 1283, 1293 (Fed. Cir. 2010) (stating that the doctrine of equivalents may apply even when “the claim does not contain words of approximation”).

The word “each” must be construed in the context of the surrounding language of Claim 1. The import of the word “each” is affected by the nearby word “independently” and the overall structure of the claim. Each particle must independently be 1) microsphere sized particles with a diameter of less than 1 mm (the “microsphere requirement”), 2) comprised of an alumina and/or silica base (the “alumina/silica requirement”), and 3) have an eggshell distribution of noble metals (the “eggshell requirement”). ‘864 Patent at 45–57. The use of the word “independently” suggests that the individual particles must meet all limitations, and each particle must be analyzed separately, without reference to other particles. Thus, it would not be enough if some particles in a given combustion promoter sample met the microsphere requirement, others met the

alumina/silica requirement, and still others met the eggshell requirement; each particle must independently meet all three to conform to the claim. The words “each” and “independently” cannot be understood to mean that merely that the average particle meet the limitations; as Grace notes, when the patentee wanted to use language connoting an average, he knew how to do so elsewhere in the patent. *See* ‘864 Patent at 15:5–6 (referring to particles that “collectively have an average (D50) size of between 60 and 90 microns”).

The specifications and the prosecution history do not shed much additional light on the meaning of “each.”⁴

Turning to the extrinsic evidence, Grace has produced several dictionary definitions of “each,” each (for lack of a better word) of which uses the word “every” in its definition. *See Collins English Dictionary* (12th ed. 2014) (ECF No. 76-4 at 5) (“every (one) of two or more considered individually”); *American Heritage Dictionary* (5th ed. 2018) (ECF No. 76-5 at 5) (“[b]eing one of two or more considered individually; every”); *Oxford Advanced Learner’s Dictionary of Current English* (9th ed. 2015) (“[u]sed to refer to every one of two or more people or things, when you are thinking about them separately”). GWA does not produce any countervailing dictionary definitions, nor does it argue that a POSITA would attach to the word “each” a specialized meaning.

⁴ Grace argues (*see* ECF No. 76 at 17) that the prosecution history also supports the conclusion that “each” must mean “each and every,” because the patent examiner had initially rejected the patent because the examiner thought the phrase “microsphere sized” was indefinite, and because the patent specification referred to only “some embodiments” being microsphere sized. (*See* ECF No. 77-4 at 32–33, 16–17.) These portions of the prosecution history do not discuss the meaning of “each” and the Court does not see how they have any bearing on the construction of the term.

The Court construes “each” to mean “every one of the microsphere sized particles considered individually.”⁵ This construction makes sense in light of the context of surrounding language in Claim 1 and is consonant with the extrinsic evidence. It is also consistent with how the Federal Circuit has interpreted the word. *See KEYnetik, Inc. v. Samsung Electronics Co., Ltd.*, 841 F. App’x 219, 224 (Fed. Cir. 2021) (“‘Each’ indicates there is a set with potentially multiple members, and that each of these potential members of the set has defined characteristics.”). The Court declines to use the phrase “each and every” as Grace suggests. The language “each and every” suggests an absolute requirement that admits of no exceptions; the language “each” on its own leaves open the possibility that a product that is insubstantially different from the claimed invention might nevertheless infringe. Indeed, one of the dictionaries Grace cites notes that the phrase “each and every . . . is somewhat criticized as redundant, and so it is, but it emphasizes both the universality and individuality of the collection being discussed, much like *every single one*.” *American Heritage Dictionary* (5th ed. 2018) (emphasis in original) (ECF No. 76-5 at 5.). When the patentee did not choose to use language suggesting such an unyielding demand for uniformity, it would be improper for the Court to do so.

E. “Microsphere sized”

The parties agree that this term refers to “particles as small as 1 micron in diameter and as large as 1,000 microns.” They differ only on whether the particles must also be spherical. The Court agrees with Grace that the particles must be spherical.

The phrase “microsphere sized” appears four times in the language of Claim 1. ‘864 Patent at 14:45–57. The phrase is not expressly defined either in the patent itself or in the specification.

⁵ Grace may present arguments that the term is indefinite under this construction at summary judgment. The Court will not rule on Grace’s indefiniteness contentions as to “each” as neither party has briefed the issue with reference to the construction adopted today, and for the reasons articulated *infra* Part IV.G.2.

The word “microsphere” is also not expressly defined, but the specification does state that “in some embodiments, the particles are less than 1 mm across the largest dimension, e.g., they are microspheres.” ‘864 Patent at 2:39–41.

Turning to the patent prosecution history, the patent examiner initially rejected Claim 1 of the patent on indefiniteness grounds because the patent did not clarify the size of a “microsphere.” (ECF No. 77-4 at 32–33.) The patentee submitted the following reply:

Applicant submits that the term “microsphere” is a term of art, the metes and bounds of which are readily understood by one of ordinary skill in the art. For example, Microspheres Online, a collection of technical information written by industry experts, defines microspheres as *spherical particles “as small as 1 micron in diameter and as large as 1,000 microns (1 mm).”* . . . This term is particularly well-established within the relevant field of FCC catalysts, appearing without the need for definition or elaboration in U.S. Patents even before WWII . . . and technical books from at least 40 years ago. . . . Clearly, to one of ordinary skill in the art, there is no indefiniteness in this phrase.

(ECF No. 77-4 at 16 (emphasis added); *see also id.* at 18 (stating that “‘microspheroidal’ refers to spherical particles have a diameter of 1 micron to 1,000 microns (1 mm)”).) The patentee also attached a declaration by its employee Dr. Natalie Herring, who attested that “[m]icrosphere is a well understood term within the field” that “is defined as spherical particles having a diameter of 1 micron to 1,000 microns (1 mm).” (ECF No. 77-3 at 43.)

The exchange between the examiner and the patentee regarding the meaning of “microsphere” seems to have focused more on the size of a microsphere than the shape of the microsphere. Nevertheless, the patentee expressly relied on the standard industry definition of “microsphere”—including the requirement that microspheres be spherical—in order to overcome an objection of indefiniteness. GWA cannot define microspheres one way to avoid rejection by the PTO and then define it another way for the purposes of litigation. *See Aylus Networks, Inc. v. Apple Inc.*, 856 F.3d 1353, 1360 (Fed. Cir. 2017) (stating that claims should not be “construed one way in order to obtain their allowance and in a different way against accused infringers”).

Thus, “microsphere” means a spherical particle with a diameter of less than 1 mm. The only remaining question is whether the word “sized” imports merely a size (*i.e.*, diameter) restriction, or also imports a shape restriction. In the abstract, the Court is not aware of a definitive answer to the question of whether a phrase of the form “X-sized” means that the object being compared to X must have the same (or at least similar) *shape* as X. For example, when weather forecasters warn of “golf ball-sized hail,” does the ordinary English speaker picture the hail to be merely the same diameter as a golf ball, or does the speaker also assume that the hail is shaped (at least roughly) like a golf ball?

The Court need not answer such abstruse questions of language, because in the context of the ‘864 Patent it is clear that the particles are spherical. If “microsphere sized” is construed to import only a diameter requirement, then the phrase “microsphere sized” would be entirely superfluous, because it is almost immediately followed in the preamble of Claim 1 by the phrase “having a diameter of less than 1 mm.” A construction that renders claim terms “void, meaningless, or superfluous” is “highly disfavored” in patent law. *Intel Corp. v. Qualcomm Inc.*, 21 F.4th 801, 810 (Fed. Cir. 2021) (internal quotation and citation omitted); *see also Bicon, Inc. v. Straumann Co.*, 441 F.3d 945, 950 (Fed. Cir. 2006) “[C]laims are interpreted with an eye toward giving effect to all terms in the claim”). Thus, to give meaning to “microsphere sized” the phrase must be understood to impose both a size and shape limitation. Any alternative would effectively read “microsphere sized” out of the language of the claim.

Furthermore, the specification states that “in any of the embodiments” the claimed invention comprises a “particle, e.g., spherical particle.” ‘864 Patent at 2:51–53. Additionally, the two illustrations accompanying the specification both show a circle that resembles the cross-section of a sphere. ‘864 Patent Sheet 1 of 3. These observations from the specification would

not suffice on their own to prove that the claim is limited to “spherical” particles, but they reinforce the Court’s conclusion that a POSITA would understand the claimed invention to be spherical.

For these reasons, the Court construes “microsphere sized” to mean “spherical particles as small as 1 micron in diameter and as large as 1,000 microns.”

One last point: The question of infringement is for another day. But the Court pauses to observe that—assuming (without deciding) that GWA is entitled to proceed on a doctrine of equivalents theory—a particle that is essentially (but not perfectly) spherical might still fall within the scope of Claim 1. During prosecution the patentee cited an article about microspheres that stated that “properties of microspheres vary[] dramatically due to . . . levels of sphericity and roundness, among other factors.” (ECF No. 77-3 at 53.) Thus, a POSITA might understand that microspheres, while essentially spherical, can deviate slightly from the Platonic form of a sphere.

F. “Eggshell”

GWA proposes that “eggshell” be construed to mean “the particle has an outer region with a relatively higher concentration of the one or more Group VIII noble metals than the center of the particle.” (ECF No. 72 at 7.) Grace proposes that the term be construed to mean “a structure with an outer layer or ‘shell’ surrounding an inner layer that is chemically distinct from the outer layer.” (*Id.*) The parties agree that Grace’s construction comports with the standard use of the word in the field, but GWA contends that it redefined the term in the patent by acting as its own lexicographer.

The Court will adopt Grace’s construction.

1. Legal Standard

As stated above, claim terms are usually given their plain and customary meaning. *Phillips*, 415 F.3d at 1312–13 (Fed. Cir. 2005). This is the meaning that the term customarily had in the relevant field at the time of the invention. *Id.* “There are only two exceptions to this general rule:

1) when a patentee sets out a definition and acts as his own lexicographer, or 2) when the patentee disavows the full scope of a claim term either in the specification or during prosecution.” *Thorner*, 669 F.3d at 1365.

A patentee may depart from the ordinary meaning of a term and act as its own lexicographer by expressly defining the term in the patent. “To act as its own lexicographer, a patentee must clearly set forth a definition of the disputed claim term other than its plain and ordinary meaning.” *Id.* (quotation omitted). This definition must “clearly express an intent to redefine the term.” *Id.* (quotation omitted). This standard is “exacting.” *GE Lighting Sols., LLC v. AgiLight, Inc.*, 750 F.3d 1304, 1309 (Fed. Cir. 2014). The standard for prosecution disclaimer or disavowal is “similarly exacting.” *Thorner*, 669 F.3d at 1366. Prosecution disavowal requires that the specification or prosecution history make clear that the invention “does not include a particular feature.” *GE Lighting Sols.*, 750 F.3d at 1309 (quotation omitted). An ambiguous disavowal will not constitute prosecution disclaimer. *Schindler Elevator Corp. v. Otis Elevator Co.*, 593 F.3d 1275, 1285 (Fed. Cir. 2010).

2. Analysis

The Court is unpersuaded by GWA’s contention that it acted as its own lexicographer in defining the meaning of “eggshell.” To begin with, GWA appears to concede that the customary definition in the art is that “eggshell” refers to “a structure with an outer layer or ‘shell’ surrounding an inner layer that is chemically distinct from the outer layer.” (See ECF No. 96 at 17 (“Plaintiffs do not dispute that ‘eggshell’ is a term of art.”).) The patentee relied on this exact definition during prosecution to overcome the examiner’s rejection of the patent on the grounds that the word “eggshell” was indefinite:

Applicant submits that “microspheroidal” and “eggshell” are terms of art[.] . . . “[E]ggshell”, at least within the fields of nanoparticles and in particular catalyst particles,

refers to a structure with a thin layer or “shell” surrounding an inner layer that is chemically distinct from the outer layer. In particular, an “eggshell” particle that comprises a catalyst comprises higher levels of catalyst in the outer layer. In this particular instance, the use of “eggshell” of instant claim 1 would be understood by one of ordinary skill in the art to indicate that the particle has an outer layer (e.g., a shell) with a relatively high concentration of the one or more Group VIII noble metals and an inner layer (e.g., a core) with a relatively lower concentration of the one or more Group VIII noble metals.

(ECF No. 77-4 at 18 (emphasis added).)

The patentee also attached this statement from Dr. Herring:

“[E]ggshell” is defined as a particle structure having chemically distinct inner and outer layers, and when a catalyst is present, having a higher concentration of the catalyst in the outer layer. In my professional experience, this term is well-understood to have this meaning by those of ordinary skill in the art.

(ECF No. 77-3 at 43 (emphasis added).)

Thus, in an effort to avoid the examiner’s rejection of the patent, the patentee twice stated that “eggshell” is a term of art understood to mean a structure with a chemically distinct inner and outer layer. Granted, the patentee also went on to explain that “in this particular instance,” *i.e.*, in the context of the ‘864 Patent, a POSITA would understand the term to indicate a particle with a higher concentration of noble metals in the outer layer of the particle as compared to the inner layer. But this does not constitute a repudiation of the standard definition of “eggshell” so much as a clarification that the “eggshell” in the ‘864 Patent is a specific kind of eggshell. As the Court has already explained, a patentee cannot represent their claims one way to win approval from the PTO and then represent their claims another way to win an infringement lawsuit. *Aylus*, 856 F.3d at 1360.

Notwithstanding this reliance on the standard definition of “eggshell” in the prosecution history, GWA argues that the language of Claim 1 itself (in particular, the words after “such that”) contains a definition of “eggshell” that supersedes the definition it relied on during prosecution:

... one or more Group VIII noble metals distributed in the particle as an eggshell such that a higher concentration of the one or more Group VIII noble metals is present in the outer

region of the microsphere sized porous particle as compared to the concentration of the one or more Group VIII noble metals in the centre of the microsphere sized porous particle.

‘864 Patent at 14:51–57. This argument runs into two problems. For one, there is a presumption—albeit a defeasible one—that all claim terms are to be given independent meaning. *Bicon*, 441 F.3d at 950. If the Court adopted GWA’s construction, then all words after eggshell would be superfluous, because they would simply be repeating what “eggshell” already means. For another, the language does not clearly express an intent to redefine eggshell; instead, it seems to be explaining that the claim is directed at a certain *kind* of eggshell, namely one with a preferential concentration of noble metals in the outer region.

GWA also argues that the following passage from the specification constitutes a definition of “eggshell”:

In some embodiments, the particle can comprise two regions—a first inner region not comprising the one or more noble metals or a very low concentration of such metals and a second outer region, referred to herein as an “eggshell” comprising the one or more noble metals.

‘864 Patent at 2:45–50. This too does not meet the exacting lexicography standard. The language “[i]n some embodiments” implies that the subsequent description does not apply in all embodiments. *See Guardant Health, Inc. v. Vidal*, 2023 WL 3262962, at *2 (Fed. Cir. May 5, 2023) (“The written description makes clear that ‘[i]n some embodiments each polynucleotide in a set is mappable to a reference sequence.’ . . . It follows that other embodiments include polynucleotides that do not map to a mappable base position and thus are outside of the definition[.]”). Admittedly, the “in some embodiments” language is puzzling here because the language of Claim 1 implies that *any* embodiment within the scope of Claim 1 must contain both an inner region and an eggshell region. Nevertheless, the Court cannot read the phrase “in some embodiments” out of the specification; to the extent that the language makes the passage confusing

or irreconcilable with the language of Claim 1, that only reinforces the Court's conclusion that the passage does not contain the clarity needed to constitute lexicography of the word "eggshell."⁶

The difficulty of construing "eggshell" is compounded by the two subtly different ways in which "eggshell" is used in the patent. In the text of Claim 1, the term seems to refer to a type of distribution. *See* '864 Patent at 14:51–52 ("distributed in the particle *as an eggshell* such that . . .") (emphasis added). But in other instances, the term appears to be used synonymously with the physical region consisting of the "outer shell" or "outer region" of the particle. *See, e.g., id.* at 4:25–31 (describing the properties of the "eggshell or outer shell"); 11:24–27 (describing an embodiment of the invention as containing "an outer eggshell which may have a thickness (d) of between 1 to 10 microns which will contain almost all of the Group VIII metal.") In the face of such ambiguity about what "eggshell" means in the specification, the Court cannot conclude that the patentee acted as its own lexicographer.

The Court finds GWA's remaining arguments in favor of its proposed construction unpersuasive. GWA argues that "eggshell" cannot be given its ordinary meaning of "chemically distinct" because in prosecution it distinguished the claimed invention from the prior art because of the kind of eggshell design disclosed in the patent-in-suit. (ECF No. 77 at 25–30.) This argument does not follow. To be sure, in response to an initial rejection by the examiner, the patentee did distinguish the claimed invention from an earlier patent issued to an inventor named

⁶ Further, even if the Court did assume that this passage was definitional, it would not set forth GWA's preferred definition. Rather, the only fair reading of the sentence (if it were definitional) is that "eggshell" means the "second outer region," or, simply, "outer region." But taking "eggshell" to mean "outer region" or "second outer region" would render the language of Claim 1 nonsensical. It makes no sense to say that the noble metals are distributed "as an outer region" such that a higher proportion of noble metals are present in that same "outer region." The Court refuses to adopt such an absurd construction when the language of the patent does not compel it. *See AIA Engineering Ltd. v. Magotteaux Intern. S/A*, 657 F.3d 1264, 1277 (Fed. Cir. 2011) ("We strive, where possible, to avoid nonsensical results in construing claim language.").

Yaluris. (See ECF No. 77-4 at 18–22.) But the patentee distinguished the Yaluris patent on the grounds that the Yaluris patent involved a homogenous particle that was in no way an “eggshell” particle, not on the grounds that the Yaluris patent’s use of the term “eggshell” was different from how the patentee was using the term. (*Id.*) Indeed, as the patentee noted, the Yaluris patent never even mentioned “eggshell” or any similar term. (*Id.* at 19.) Thus, in arguing that Yaluris did not anticipate or render obvious the claimed invention, the patentee did not redefine “eggshell.”

Finally, GWA argues that adopting Grace’s proposed construction would create the incorrect impression that the claimed invention discloses “a shell or layer *on* the particle,” whereas in reality the “eggshell” distribution refers to “an outer region *of* the particle.” (ECF No. 96 at 19 (emphasis in original).) GWA is correct that the patent does not teach the formation of a separate structural component implanted on top of the particle, but instead teaches a single particle with differential distributions of noble metal. See 864 Patent at 8:43–57 (describing how to formulate the claimed invention). However, this description of the invention is not at odds with the Court’s construction of “eggshell,” which simply requires that the outer layer or shell be chemically distinct from the inner layer. Presumably, the very fact that there is a higher concentration of noble metals in the outer layer versus the inner layer of the claimed invention means that the two layers are indeed chemically distinct.

Because Grace’s construction is undisputedly the customary meaning of “eggshell” within the field, and because nothing in the intrinsic evidence of the patent shows that the patentee acted as its own lexicographer, the Court agrees that Grace’s proposed instruction is correct.⁷ Thus,

⁷ The Court does not consider Grace’s argument that the patent prosecution constitutes disclaimer or disavowal, because it does not need to reach this argument to arrive at the conclusion that Grace’s proposed construction is correct. Likewise, the Court does not consider Grace’s argument that extrinsic evidence supports adopting its proposed construction of “eggshell,” as the Court reaches this conclusion based solely on the patent’s intrinsic evidence.

“eggshell” is construed to mean “a structure with an outer layer or shell surrounding an inner layer that is chemically distinct from the outer layer.”

G. “Outer region” and “centre”

The final issue for the Court to address is the construction of the terms “outer region” and “centre,” and the question of whether the terms are indefinite.

1. Legal Standard

The definiteness provision of the Patent Act requires that a patent “conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the inventor . . . regards as the invention.” 35 U.S.C. § 112(b). This provision “require[s] that a patent’s claims, viewed in light of the specification and prosecution history, inform those skilled in the art about the scope of the invention with reasonable certainty.” *Nautilus, Inc. v. Biosig Instruments, Inc.*, 572 U.S. 898, 910 (2014). The reasonable certainty standard aims to balance “the inherent limitations of language” with the requirement that a patent be “precise enough to afford clear notice of what is claimed, thereby apprising the public of what is still open to them.” *Id.* at 908 (alterations and quotations omitted). “Whether a claim complies with the definiteness requirement of 35 U.S.C. § 112 ¶ 2 is a matter of claim construction[.]” *Noah Systems, Inc. v. Intuit Inc.*, 675 F.3d 1302, 1311 (Fed. Cir. 2012). The party asserting indefiniteness has the burden of proving any fact necessary to make that determination by clear and convincing evidence. *Ironburg Inventions Ltd. v. Valve Corp.*, 64 F.4th 1274, 1284 (Fed. Cir. 2023).

2. Analysis

The parties purport to be in a dispute about indefiniteness, but in reality their dispute centers on the antecedent—and decisive—question of how to construe “outer region.” The nub of the parties’ dispute is whether the “outer region” refers to the section of the particle with a depth of

between 1-10 microns from the particle's surface, or whether it is a more generic area with no precise numerical boundaries.

Starting with the language of the claim, neither the phrase “outer region” nor “centre” are defined. Nor does the context of surrounding claim language provide much clarification on the meaning of the terms, other than suggesting that the terms refer to different—and mutually exclusive—portions of the claimed combustion promoter particle. *See* ‘864 Patent at 14:51–57. And neither party contends that either term has any specialized meaning in this field.

Because the claim language does not resolve the question of how to construe the terms, the Court next turns to the specification. The specification references “outer region” several times, all in the context of discussing the preferential concentration of noble metals in this region. *See, e.g., id.* at 5:54–56, 5:67–6:2. The specification contrasts “outer region” with “centre,” and explains that the concentration of noble metal in the outer region must be higher than in the center, but provides no criteria for distinguishing one region from the other (other than by reference to the differential concentration of noble metals). *Id.* The specification does appear to equate “outer region” with the “eggshell” of the particle, *see* ‘864 Patent at 2:48–50, but this equivalence does little to explain what the “outer region” of the particle is other than the area with a higher proportion of noble metals. The specification also contains a reference to the “outer shell” of the particle, which is equated with “eggshell.” *Id.* at 4:25. It recites that:

The eggshell or outer shell suitably has a depth from the outer surface towards the interior of the particle of between 1 to 10 microns. In this eggshell, which includes the outer surface of the particle, suitably more than 60 wt %, suitably more than 80 wt % and even more suitably more than 90 wt % of the noble metal is present of the total of noble metal present in the particle.

Id. at 4:25–31. The specification contains another reference to this 1–10-micron range, in its written description accompanying Figure 2:

FIG. 2 shows a combustion promoter as prepared according to process of the invention. The alumina micro sphere has the same dimension and mesopore structure as the alumina microsphere of FIG. 1. The core of the particle contains little to no Group VIII metals and an outer eggshell which may have a thickness (d) of between 1 to 10 microns will contain almost all of the Group VIII metal.

Id. at 11:21–27.

In analyzing these two passages, the Court begins by observing that in these passages “eggshell,” “outer shell,” and “outer eggshell” appear to be used synonymously to mean the “outer region” of the particle. The Court again runs into the difficulty resulting from the fact that at times the patent uses “eggshell” to refer to a physical region of the particle (namely, the outer region), but in Claim 1, “eggshell” appears to refer to a pattern of distribution or structure of a particle, which contains both an outer region and an inner region or center. There is no easy way to reconcile these two different uses of “eggshell” within the patent.

Nevertheless, the Court agrees with Grace that—even assuming that “eggshell” and “outer region” refer to the same portion of the particle—the two references to the 1–10-micron range in the specification do not define the scope of the “outer region.” “[N]on-limiting examples do not on their own expressly define the bounds—the limits—of the claim.” *IQASR LLC v. Wendt Corp.*, 825 F. App’x 900, 906 (Fed. Cir. 2020). The first reference to the 1–10-micron range states that “suitably” the outer region would be within this size range. This language clearly expresses that this range is a preferred embodiment, rather than a limitation. The second reference to the 1–10-micron range is similarly noncommittal. It states, in describing figure 2, that the outer region “may have a thickness (d) of between 1 to 10 microns[.]” (emphasis added). The use of “may” implies that the outer region may, but need not, have a thickness of between 1 to 10 microns. Thus, this reference in the specification to the 1–10-micron range cannot be limiting. *See Innova/Pure Water*,

381 F.3d at 1117 (explaining that “particular embodiments appearing in the written description will not be used to limit claim language that has broader effect”).

Because of the curious way that the parties have briefed the issue, neither party has presented an alternative proposed construction of “outer region” in the event that the Court finds that the term is not limited to the 1–10-micron range. However, “outer region” and “centre” are ordinary terms that are readily understandable to a layperson, and the parties agree that they have no specialized meaning here. Additionally, upon reviewing the patent’s intrinsic evidence, the Court can find no helpful way to define “outer region” at any greater degree of specificity than simply to say that it is the portion of the particle that is toward the particle’s exterior.⁸ See *U.S. Surgical Corp. v. Ethicon, Inc.*, 103 F.3d 1554, 1568 (Fed. Cir. 1997) (“Claim construction . . . is not an obligatory exercise in redundancy.”). Furthermore, the parties do not appear to dispute the ordinary meaning of “outer region,” thus making inapplicable the rule in *O2 Micro Int’l* that the Court must construe disputed terms. 521 F.3d at 1362. Accordingly, the Court will construe “outer region” to have its plain and ordinary meaning. And the Court will adopt the parties’ agreed position that “centre”—assuming it is not indefinite—means “a region distinguishable from the outer region of the particle.”

Finally, Grace has raised a substantial question as to whether the terms “outer region” and “centre” are indefinite. The potential problem for GWA is that—without a numerical boundary—the terms do not immediately appear to provide any objective metric for a POSITA to know where one region of the particle ends and the other begins. If the regions are defined solely by their relative concentration of noble metals, then a POSITA might have no way of knowing if that higher

⁸ The Court declines to construe “outer region” to embrace the concept of a preferential concentration of the noble metals, as such a construction would inject a confusing degree of circularity into the language of Claim 1.

concentration of noble metals must occur in the outer 1% of the particle, the outer 10%, or even the outer 99% of the particle.

However, the Court will not rule on indefiniteness at this time. For one, the issue is not well briefed, as GWA responded to the substance of indefiniteness only in its Reply brief, and neither party has precisely addressed their briefing toward the issue of whether the term “outer region” is indefinite if it is simply given its ordinary meaning.⁹ Second, Grace relies entirely on arguments from counsel in its briefs, and does not cite to any extrinsic evidence that shows that a POSITA would not understand the objective boundaries of the term. Third, because of the inherently fact-based nature of indefiniteness, “it is common practice for courts to defer on the indefiniteness determination until the summary judgment stage, allowing the parties the benefits of discovery and further development of the facts.” *Cambria Co. LLC v. Hirsch Glass Corp.*, Civ. No. 21-10092-MAS-LHG, 2022 WL 4031422, at *4 (D.N.J. Sept. 2, 2022); *see also 3rd Eye Surveillance, LLC v. United States*, 157 Fed. Cl. 673, 679 (Ct. Fed. Cl. 2022) (explaining that courts often defer ruling on indefiniteness until summary judgment); *Omnia Med., LLC v. PainTEQ, LLC*, Civ. No. 22-145-VMC-TGW, 2023 WL 4305224, at *9 (M.D. Fla. June 30, 2023). Finally, the Court observes that—while the terms “outer region” and “centre” are no models of precision—they are not “so abstract or meaningless to render them indecipherable” and thus facially indefinite. *Cambria*, 2022 WL 4031422, at *5. For these reasons, the Court will defer its consideration of indefiniteness until summary judgment.

⁹ To be sure, Grace does argue that the term is not limited to the 1–10-micron range and that it is indefinite. However, Grace’s briefing skips over the preliminary question of how to construe the term “outer region” and instead focuses entirely on arguing that the term (and “centre”) is indefinite. This method of argument is unhelpful to the Court because the “court must attempt to determine what a claim means before it can determine whether the claim is invalid for indefiniteness.” *3rd Eye Surveillance, LLC v. United States*, 157 Fed. Cl. 673, 679 (Ct. Fed. Cl. 2022) (alteration and quotation omitted). Without clarity as to what construction Grace is applying to the terms “outer region” and “centre,” the Court is not well positioned to evaluate Grace’s indefiniteness arguments as to these terms.

V. CONCLUSION

For the foregoing reasons, the Court construes the disputed claim terms as follows:

1. **“CO to CO2 combustion promoter”** is limiting;
2. **“Combustion”** means: “a process of oxidation that releases heat and usually light”;
3. **“Each microsphere sized porous particle”** means: “every one of the microsphere sized particles considered individually”;
4. **“Microsphere sized”** means: “spherical particles as small as 1 micron in diameter and as large as 1,000 microns”;
5. **“Eggshell”** means: “a structure with an outer layer or shell surrounding an inner layer that is chemically distinct from the outer layer”;
6. **“Outer region”** is given its plain and ordinary meaning; and
7. **“Centre”** means: “a region distinguishable from the outer region of the particle”.

DATED this 30 day of October, 2023.

BY THE COURT:

A handwritten signature in blue ink, reading "James K. Bredar", is written over a horizontal line.

James K. Bredar
Chief Judge